STIC Search Report
EIC 1700

STIC Database Tracking Number 117222

TO:	From:
Raymond Alejandro Location: REM 6B59 Art Unit : 1745 March 22, 2004 Case Serial Number: 09/992591	Kathleen Fuller Location: EIC 1700 REMSEN 4B28 Phone: 571/272-2505 Kathleen.Fuller@uspto.gov

Search Notes

Access DB# 117222

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Raymond Alejandro Examiner #: 76895 Date: 03/17/04
Art Unit: 1745 Phone Number 305-571-272-1282 Serial Number: 09/992591
Mail Box and Bldg/Room Location: Remsen 6B-59 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

****

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Shut-Down Procedure for Fuel Cell-Fuel Processing System

Inventors (please provide full names): Margiott et al

Earliest Priority Filing Date: 11/06/01

For Sequence Searches Only *Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

Please, search for subject matter of claims 1-17 (attached copy).

****

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Searcher: K. Fuller
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Date Searcher Picked Up:
Date Completed: 3/22/04
Searcher Prep & Review Time: 20
Clerical Prep Time:
Online Time: 28

Type of Search

NA Sequence (#)
AA Sequence (#)
Structure (#)
Bibliographic ✓
Litigation
Fulltext
Patent Family
Other

Vendors and cost where applicable

STN ✓
Dialog
Questel/Orbit
Dr.Link
Lexis/Nexis
Sequence Systems
WWW/Internet
Other (specify)

PTO-1590 (8-01)

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FILE COVERS 1907 - 22 Mar 2004  VOL 140 ISS 13
FILE LAST UPDATED: 21 Mar 2004  (20040321/ED)

 This file contains CAS Registry Numbers for easy and accurate
 substance identification.


=> D QUE L17
L3            1 SEA FILE=REGISTRY ABB=ON  1333-74-0
L4       917057 SEA FILE=HCAPLUS ABB=ON  L3 OR H2 OR HYDROGEN
L5        10250 SEA FILE=HCAPLUS ABB=ON  L4 AND FUEL(W)CELL#
L10       30579 SEA FILE=HCAPLUS ABB=ON  L3(L)(PREP OR IMF OR SPN)/RL
L15          72 SEA FILE=HCAPLUS ABB=ON  L5 AND (SHUTDOWN? OR SHUT(W)DOWN?)
L16          15 SEA FILE=HCAPLUS ABB=ON  L15 AND PURG?
L17           3 SEA FILE=HCAPLUS ABB=ON  L10 AND L16


=> FILE WPIX
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FILE LAST UPDATED:          18 MAR 2004      <20040318/UP>
MOST RECENT DERWENT UPDATE:     200419        <200419/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE


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    THE TIME RANGE CODE WILL ALSO CHANGE FROM 018 TO 2004.
    SDIS USING THE TIME RANGE CODE WILL NEED TO BE UPDATED.


KATHLEEN FULLER EIC 1700  REMSEN 4B28 571/272-2505
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FOR FURTHER DETAILS: http://thomsonderwent.com/chem/polymers/ <<<

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L5         10250 SEA FILE=HCAPLUS ABB=ON  L4 AND FUEL(W)CELL#
L15           72 SEA FILE=HCAPLUS ABB=ON  L5 AND (SHUTDOWN? OR SHUT(W)DOWN?)
L18           12 SEA FILE=WPIX ABB=ON  L15 AND PURG?

=>
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Jicst

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=> D QUE L20
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L4        917057 SEA FILE=HCAPLUS ABB=ON  L3 OR H2 OR HYDROGEN
L5         10250 SEA FILE=HCAPLUS ABB=ON  L4 AND FUEL(W)CELL#
L15           72 SEA FILE=HCAPLUS ABB=ON  L5 AND (SHUTDOWN? OR SHUT(W)DOWN?)
L20            0 SEA FILE=JICST-EPLUS ABB=ON  L15 AND PURG?


=> FILE JAPIO
FILE 'JAPIO' ENTERED AT 11:00:29 ON 22 MAR 2004
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FILE LAST UPDATED: 1 MAR 2004        <20040301/UP>
FILE COVERS APR 1973 TO OCTOBER 31, 2003

<<< GRAPHIC IMAGES AVAILABLE >>>

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L5         10250 SEA FILE=HCAPLUS ABB=ON  L4 AND FUEL(W)CELL#
L15           72 SEA FILE=HCAPLUS ABB=ON  L5 AND (SHUTDOWN? OR SHUT(W)DOWN?)
L21            2 SEA FILE=JAPIO ABB=ON  L15 AND PURG?


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FILE COVERS 1970 TO DATE.

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L15           72 SEA FILE=HCAPLUS ABB=ON  L5 AND (SHUTDOWN? OR SHUT(W)DOWN?)
L22            0 SEA FILE=COMPENDEX ABB=ON  L15 AND PURG?


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FILE COVERS 1964 TO DATE.

<<<SIMULTANEOUS LEFT AND RIGHT TRUNCATION AVAILABLE IN
   THE BASIC INDEX (/BI) >>>

=> D QUE L23
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L4        917057 SEA FILE=HCAPLUS ABB=ON  L3 OR H2 OR HYDROGEN
L5         10250 SEA FILE=HCAPLUS ABB=ON  L4 AND FUEL(W)CELL#
L15           72 SEA FILE=HCAPLUS ABB=ON  L5 AND (SHUTDOWN? OR SHUT(W)DOWN?)
L23            0 SEA FILE=NTIS ABB=ON  L15 AND PURG?


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FILE COVERS 1969 TO DATE.

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=> D QUE L24
L3             1 SEA FILE=REGISTRY ABB=ON  1333-74-0
L4        917057 SEA FILE=HCAPLUS ABB=ON  L3 OR H2 OR HYDROGEN
L5         10250 SEA FILE=HCAPLUS ABB=ON  L4 AND FUEL(W)CELL#
L15           72 SEA FILE=HCAPLUS ABB=ON  L5 AND (SHUTDOWN? OR SHUT(W)DOWN?)
L24            0 SEA FILE=INSPEC ABB=ON  L15 AND PURG?


=> DUP REM L17 L18 L21
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PROCESSING COMPLETED FOR L17
PROCESSING COMPLETED FOR L18
PROCESSING COMPLETED FOR L21
L25           16 DUP REM L17 L18 L21 (1 DUPLICATE REMOVED)

=> D ALL L25 1-16

L25  ANSWER 1 OF 16  HCAPLUS  COPYRIGHT 2004 ACS on STN DUPLICATE 1
AN   2003:355671  HCAPLUS
DN   138:324150
ED   Entered STN:  09 May 2003
TI   Shutdown procedure for fuel cell fuel
     processing system
IN   Margiott, Paul R.; Callahan, Christopher W.; Perry, Michael L.; Scheffler,
     Glenn W.
PA   USA
SO   U.S. Pat. Appl. Publ., 8 pp.
     CODEN: USXXCO
DT   Patent
LA   English
IC   ICM  H01M008-04
```

applicant

ICS H01M008-06
NCL 429017000; 429022000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2003087138	A1	20030508	US 2001-992591	20011106
	WO 2003041203	A1	20030515	WO 2002-US33602	20021018

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

PRAI US 2001-992591 A 20011106

AB The invention is about a **fuel cell** system that includes fuel processing components, such as a reformer and shift converter, for converting an organic fuel to **hydrogen**, is **shutdown** by disconnecting the **fuel cell** from its load and **purging** the fuel processing components of residual **hydrogen** with a flow of air. The **purge** air may be forced through the components in series or in parallel, using a blower; or, the **purge** air may be allowed to enter the components through a low inlet, whereupon the air rises through the components by natural circulation and exits through a high outlet, along with the residual **hydrogen**.

ST **fuel cell** fuel processing system **shutdown** procedure

IT Fuels
(organic; **shutdown** procedure for **fuel cell** fuel processing system)

IT **Fuel cells**
Reforming apparatus
(**shutdown** procedure for **fuel cell** fuel processing system)

IT Fuel gas manufacturing
(steam reforming; **shutdown** procedure for **fuel cell** fuel processing system)

IT **1333-74-0P, Hydrogen**, uses
RL: **SPN (Synthetic preparation)**; TEM (Technical or engineered material use); **PREP (Preparation)**; USES (Uses)
(**shutdown** procedure for **fuel cell** fuel processing system)

L25 ANSWER 2 OF 16 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:300492 HCAPLUS
DN 138:290450
ED Entered STN: 18 Apr 2003
TI Procedure for **purging** a **fuel cell** system with inert gas made from organic fuel
IN Meyer, Alfred P.; Callaghan, Vincent M.
PA UTC Fuel Cells, LLC, USA
SO U.S. Pat. Appl. Publ., 6 pp.
CODEN: USXXCO

DT Patent
LA English
IC ICM H01M008-06
NCL 429013000; 429017000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 2003072978	A1	20030417	US 2001-975601	20011011
	US 6645650	B2	20031111		
PRAI	US 2001-975601		20011011		

AB A procedure for **purging** a **fuel cell** system at start-up or **shutdown** comprises directing the organic fuel, along with air, into a burner to produce a gas that is essentially inert to the **fuel cell**, such as a gas of nitrogen, carbon dioxide and water vapor. That inert gas is passed through either or both the **fuel cell** and fuel processing system components, such as a reformer and shift converter, to **purge** those components of undesirable gases. In the case of **shutdown**, after the cell has been disconnected from the primary load, the inert gas produced in the burner is passed either in series or in parallel through the **fuel cell** and fuel processing system.
ST **fuel cell** system **purging** inert gas org fuel
IT **Fuel cells**
Reforming apparatus
Water gas shift reaction catalysts
Water vapor
(procedure for **purging fuel cell** system with inert gas made from organic fuel)
IT Combustion
(products; procedure for **purging fuel cell** system with inert gas made from organic fuel)
IT Fuel gas manufacturing
(reforming; procedure for **purging fuel cell** system with inert gas made from organic fuel)
IT Nickel alloy, base
RL: CAT (Catalyst use); USES (Uses)
(procedure for **purging fuel cell** system with inert gas made from organic fuel)
IT 7440-02-0, Nickel, uses
RL: CAT (Catalyst use); USES (Uses)
(procedure for **purging fuel cell** system with inert gas made from organic fuel)
IT **1333-74-0P, Hydrogen**, uses
RL: **SPN (Synthetic preparation)**; TEM (Technical or engineered material use); **PREP (Preparation)**; USES (Uses)
(procedure for **purging fuel cell** system with inert gas made from organic fuel)
IT 124-38-9, Carbon dioxide, uses 7727-37-9, Nitrogen, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(procedure for **purging fuel cell** system with inert gas made from organic fuel)

L25 ANSWER 3 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-617131 [58] WPIX
CR 2002-574449 [61]
DNN N2003-491499
TI Operating **fuel cell** system shutting down procedure for

automotive applications, involves stopping flow of **hydrogen** containing fuel to anode flow field and displacing remaining fuel with air by blowing air through field.

DC X16
IN REISER, C A; SAWYER, R D; YANG, D
PA (REIS-I) REISER C A; (SAWY-I) SAWYER R D; (YANG-I) YANG D
CYC 1
PI US 2003134164 A1 20030717 (200358)* 11p H01M008-00
ADT US 2003134164 A1 CIP of US 2000-742497 20001220, US 2002-305300 20021126
PRAI US 2002-305300 20021126; US 2000-742497 20001220
IC ICM H01M008-00
AB US2003134164 A UPAB: 20030910
NOVELTY - The procedure involves disconnecting primary electricity using a device or a load from an external circuit (178). The flow of fresh **hydrogen** containing fuel from the fuel source (142) to an anode flow field is then stopped. The remaining fuel in the anode flow field is displaced with air by blowing air through the anode flow field.

USE - Used for shutting down operating **fuel cell** systems in automotive applications.

ADVANTAGE - The procedure **purges** the anode flow filed with air rapidly instead of using an inert gas such as nitrogen, thereby ensuring safe and cost-effective **shut-down** without performance degradation.

DESCRIPTION OF DRAWING(S) - The drawing shows a schematic depiction of a **fuel cell** system that may be operated in accordance with the **shutdown** procedures.

Fuel source 142
External circuit. 178
Dwg.1/3
FS EPI
FA AB; GI
MC EPI: X16-C; X16-C09; X16-C15

L25 ANSWER 4 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-267112 [26] WPIX
CR 2003-015050 [01]
DNC C2003-069699
TI Shift converter for reducing amount of carbon monoxide in process gas, has catalyst chamber comprising catalyst composition which contains noble metal catalyst on ceria and/or zirconia support.
DC E36 H04 J04 L03
IN SILVER, R G
PA (SILV-I) SILVER R G
CYC 1
PI US 2003007912 A1 20030109 (200326)* 7p B01J008-02
ADT US 2003007912 A1 Div ex US 2001-852333 20010509, US 2002-217398 20020813
FDT US 2003007912 A1 Div ex US 6455182
PRAI US 2001-852333 20010509; US 2002-217398 20020813
IC ICM B01J008-02
AB US2003007912 A UPAB: 20030428
NOVELTY - A shift converter has a catalyst chamber comprising a catalyst composition for converting a portion of carbon monoxide and water contained in a process gas into carbon dioxide and **hydrogen**. The catalyst composition comprises noble metal catalyst on a promoted support. The promoted support is a mixed metal oxide of cerium oxide and/or zirconium oxide.

DETAILED DESCRIPTION - A shift converter (16) includes a catalyst chamber (32) comprising an inlet (36) for entry of a process gas (20, 24),

an outlet (38) downstream of the inlet for exit of effluent from the chamber, and a catalyst composition (50) disposed between the inlet and outlet for converting a portion of carbon monoxide and water contained in a process gas into carbon dioxide and **hydrogen.**

The catalyst composition contains noble metal oxide on a promoted support. The promoted support is a mixed metal oxide of cerium oxide and/or zirconium oxide.

USE - The shift converter is used for reducing the amount of carbon monoxide in a process gas using water-gas shift reaction. It can be connected in a fuel-processing sub-system for a **fuel cell.**

ADVANTAGE - The shift converter incorporates an improved catalyst composition which efficiently converts carbon monoxide to carbon dioxide and water without the need for special catalyst pre-conditioning and protection from air exposure. The catalyst composition operates independent of any requirement for pre-reduction, **shutdown purge,** or inert atmosphere.

DESCRIPTION OF DRAWING(S) - The figure is a simplified functional schematic diagram of a **fuel cell** power plant.

Shift converter 16
Process gas 20, 24
Catalyst chamber 32
Inlet 36
Outlet 38
Catalyst composition 50
Dwg.1/2

FS CPI
FA AB; GI; DCN
MC CPI: E11-F02; E11-Q02; E31-A02; E31-N05C; H04-E04; H04-F02E; J04-E09; L03-E04; L03-E04F; N02-E02; N02-E04; N02-F02; N06-F; N07-D02B

L25 ANSWER 5 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2004-102759 [11] WPIX
DNN N2004-082038 DNC C2004-042559
TI **Hydrogen** production apparatus for **fuel cell,** has **purge** air supply line with shut-off valve, connected to water supply line of heat exchanger for **purging** steam before **shut down.**
DC E36 H04 L03 X16
PA (HITG) BABCOCK-HITACHI KK
CYC 1
PI JP 2003327404 A 20031119 (200411)* 9p C01B003-38
ADT JP 2003327404 A JP 2002-137166 20020513
PRAI JP 2002-137166 20020513
IC ICM C01B003-38
ICA H01M008-04; H01M008-06; H01M008-10
AB JP2003327404 A UPAB: 20040213
NOVELTY - A heat exchanger is arranged between a modification catalyst which generates **hydrogen** using hydrocarbon fuel, oxygen or air and water or steam, and carbon monoxide shift catalyst, to evaporate water by heat exchange with reformed gas. A **purge** air supply line with shut off valve, is connected to the water supply line to **purge** steam from the heat exchanger, before **shut down** operation.

DETAILED DESCRIPTION - A heat exchanger (12) is arranged between a modification catalyst (11) which generates **hydrogen** using hydrocarbon fuel, oxygen or air and water or steam, and carbon monoxide shift catalyst (13), to evaporate water by heat exchange with reformed

gas. A **purge** air supply line (32) with shut off valve, is connected to the water supply line (31) to **purge** steam from the heat exchanger, before **shut down** operation. The **purge** air supply line is branched from air supply line of the modification catalyst.

INDEPENDENT CLAIMS are also included for the following:

(1) operating method of **hydrogen** production apparatus; and

(2) **shutdown** method of **hydrogen** production apparatus.

USE - For production of **hydrogen** used for solid polymer **fuel cell** type electric power generation system.

ADVANTAGE - Enables quick restart after **shut down** operation, as **purge** air supply is provided for **purging** steam from heat exchanger before **shut down.**

DESCRIPTION OF DRAWING(S) - The figure shows a block diagram of the **hydrogen** production apparatus. (Drawing includes non- English language text).

modification catalyst 11
heat exchanger 12
carbon monoxide shift catalyst 13
water supply line 31
purge air supply line 32
shut off valve 36

Dwg.1/10

FS CPI EPI
FA AB; GI; DCN
MC CPI: E31-A02; H04-E06; H04-F02E; L03-E04; N07-J; N07-L03A
EPI: X16-C01; X16-C09

L25 ANSWER 6 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2004-047104 [05] WPIX
DNN N2004-038369 DNC C2004-019646
TI Fuel treating equipment for producing **hydrogen** gas, maintains temperature of reaction unit which oxidizes carbon monoxide to carbon dioxide, to fixed temperature, after **shutdown** of equipment.
DC E36 H06 L03 X16
PA (MITQ) MITSUBISHI ELECTRIC CORP
CYC 1
PI JP 2003313007 A 20031106 (200405)* 11p C01B003-48
ADT JP 2003313007 A JP 2002-116507 20020418
PRAI JP 2002-116507 20020418
IC ICM C01B003-48
ICS C01B003-32; C01B003-38
AB JP2003313007 A UPAB: 20040120

NOVELTY - A temperature control unit maintains the temperature of a reaction unit (1b) which oxidizes carbon monoxide which is formed by reforming a fuel containing hydrocarbon, alcohol, or ether, into carbon dioxide, to fixed temperature, after the **shutdown** of the fuel treating equipment.

DETAILED DESCRIPTION - The equipment has a reforming unit (1a) which reforms the fuel, to produce heating gas comprising **hydrogen** as the main component, which is integrally provided with the reaction unit. A carbon monoxide removal unit (1c) is provided to remove carbon monoxide from the heating gas ejected from the reaction unit. The reformed-gas discharge pipe of the equipment, is connected to the fuel-gas supply pipe of a **fuel- cell** system. The heat of the heating gas is used for maintaining the temperature of the reaction unit, to the fixed temperature which is lower than the operating temperature of the reaction

unit, and which is equal to or lower than the temperature of the heating gas.

An INDEPENDENT CLAIM is also included for operation method of fuel treating equipment.

USE - For reforming fuel containing hydrocarbon, alcohol, or ether, into heating gas containing **hydrogen** as main component, which is used in **fuel cells**.

ADVANTAGE - Since the temperature of the reaction unit is held at preset temperature, after **shutdown** of the equipment, eliminates the need to **purge** an inert gas into the reaction unit, during **shutdown**. Hence eliminates the need for inert-gas supply installation. Reduces deterioration of the catalyst by using the catalyst containing copper. Effectively uses the heat produced in the reforming unit, for maintaining the temperature of the reaction unit.

DESCRIPTION OF DRAWING(S) - The figure shows the schematic view of the fuel treating equipment. (Drawing includes non- English language text).

Reforming unit 1a
Reaction unit 1b
Carbon monoxide removal unit 1c
Fuel supply unit 2
Heater 10
Dwg.1/10

FS CPI EPI
FA AB; GI; DCN
MC CPI: E31-A02; H06-A03; L03-E04; N02-D01
EPI: X16-C09; X16-C17

L25 ANSWER 7 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-182853 [18] WPIX
DNN N2003-143874 DNC C2003-048188
TI Fuel processor for generating **hydrogen** gas, has primary reactor, water-gas-shift reactor, and water adsorbent.
DC E36 H04 H06 L03 X16 X22
IN GITTLEMAN, C S
PA (GITT-I) GITTLEMAN C S; (GENK) GENERAL MOTORS CORP
CYC 100
PI US 2002168306 A1 20021114 (200318)* 9p B01J008-04
WO 2002092215 A1 20021121 (200318) EN B01J008-02
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VN YU ZA ZM ZW
ADT US 2002168306 A1 US 2001-853398 20010514; WO 2002092215 A1 WO 2002-US14779 20020509
PRAI US 2001-853398 20010514
IC ICM B01J008-02; B01J008-04
ICS B01J035-00; B01J035-02
AB US2002168306 A UPAB: 20030317
NOVELTY - A fuel processor comprises:

(i) a primary reactor for converting a hydrocarbon-based fuel to **hydrogen**, carbon dioxide, carbon monoxide and water;

(ii) water-gas-shift reactor having an inlet in fluid communication with an outlet of the primary reactor; and

(iii) a water adsorbent within a flow path between the outlet of the

primary reactor and an outlet of the water-gas-shift reactor.

DETAILED DESCRIPTION - A fuel processor comprises:

(a) a primary reactor (102) for converting a hydrocarbon-based fuel to **hydrogen**, carbon dioxide, carbon monoxide and water;

(b) water-gas-shift reactor (104) having an inlet in fluid communication with an outlet (108) of the primary reactor; and

(c) a water adsorbent (124) located within a flow path between the outlet of the primary reactor and an outlet (120) of the water-gas-shift reactor.

The water-gas-shift reactor contains a catalyst (118) adapted to convert a portion of carbon monoxide from the primary reactor to carbon dioxide and **hydrogen**. The water adsorbent generates heat during startup of the fuel processor by adsorbing a portion of the water from the primary reactor.

An INDEPENDENT CLAIM is included for a method of heating the fuel processor during startup, comprising providing the water adsorbent within the flow path between the outlet of the primary reactor and the outlet of the water-gas-shift reactor.

USE - For generating **hydrogen** gas.

ADVANTAGE - The water adsorbent having a high heat of adsorption produces heat as it adsorbs water in the reformate. Heat generated by water adsorption enhances the rate at which the fuel processor components, e.g. the water-gas-shift reactor, reach their operating temperatures. In addition water adsorption reduces water condensation on the water-gas-shift reactor catalyst. Once the fuel processor components attain their operating temperatures, water desorbs from the adsorbent and is available for converting carbon monoxide to carbon dioxide and **hydrogen** in the water-gas-shift reactor.

DESCRIPTION OF DRAWING(S) - The figure is a schematic drawing of a portion of a fuel processor.

Primary reactor 102
Water-gas-shift reactor 104
Preferential oxidation reactor 106
Outlet of the primary reactor 108
Catalyst 118
Outlet of the water-gas-shift reactor 120
Water adsorbent 124
Second water adsorbent 130

Dwg.1/3

FS CPI EPI
FA AB; GI; DCN
MC CPI: E11-S; E31-A02; E31-A05; E31-N05B; E31-N05C; H04-E06; H04-F02E; H06-A03; L03-E04F; N06-A
EPI: X16-C01; X22-F01

L25 ANSWER 8 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-574449 [61] WPIX
CR 2003-617131 [58]
DNN N2002-455333
TI **Fuel cell**, such as PEM type, shutting down procedure, e.g. for vehicle, involves disconnecting primary load and stopping flow of **hydrogen** containing fresh fuel to anode flow field plate in which remaining fuel is displaced with air.
DC X16 X21
IN REISER, C A; SAWYER, R D; YANG, D
PA (REIS-I) REISER C A; (SAWY-I) SAWYER R D; (YANG-I) YANG D
CYC 1
PI US 2002076583 A1 20020620 (200261)* 10p H01M008-04

ADT US 2002076583 A1 US 2000-742497 20001220
PRAI US 2000-742497 20001220
IC ICM H01M008-04
AB US2002076583 A UPAB: 20030910
NOVELTY - A primary load switch (154) is opened to disconnect a primary load (146) from an external circuit (178) and a valve (166) is closed to stop flow of **hydrogen** containing fresh fuel from a fuel source (140) to an anode flow field plate (118). The fuel remaining in the flow field is displaced with air by blowing air through the flow field plate.
USE - For shutting down an operating PEM **fuel cell** system in vehicle.
ADVANTAGE - Since the fuel remaining in the anode fuel flow field plate is displaced using air, the need for **purging** with an inert gas such as nitrogen is eliminated. Thus the cell performance decay due to corrosion of the cell catalyst and catalyst support by oxygen generated using the inert gas is prevented.
DESCRIPTION OF DRAWING(S) - The figure shows the schematic view of the **fuel cell** system.
Anode flow field plate 118
Fuel source 140
Primary load 146
Primary load switch 154
Valve 166
External circuit 178
Dwg.1/3
FS EPI
FA AB; GI
MC EPI: X16-C01C; X16-C09; X16-C15; X21-A01F; X21-B01A

L25 ANSWER 9 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-015050 [01] WPIX
CR 2003-267112 [26]
DNN N2003-011033 DNC C2003-003673
TI Reducing the amount of carbon monoxide in process fuel gas, involves passing the gas through a noble metal catalyst composition placed in a shift converter, to convert carbon monoxide to carbon dioxide.
DC E36 H04 L03 X16
IN SILVER, R G
PA (UTCF-N) UTC FUEL CELLS LLC
CYC 101
PI US 6455182 B1 20020924 (200301)* 6p C01B003-16
WO 2002090247 A1 20021114 (200302) EN C01B003-16
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG UZ VN YU ZA ZM ZW
EP 1390290 A1 20040225 (200415) EN C01B003-16
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI TR
ADT US 6455182 B1 US 2001-852333 20010509; WO 2002090247 A1 WO 2002-US12972 20020423; EP 1390290 A1 EP 2002-744122 20020423, WO 2002-US12972 20020423
FDT EP 1390290 A1 Based on WO 2002090247
PRAI US 2001-852333 20010509
IC ICM C01B003-16
ICS H01M008-04
AB US 6455182 B UPAB: 20040302

NOVELTY - A noble metal catalyst composition having a promoted support comprising a mixed metal oxide of ceria and zirconia, is placed in a shift converter. Process fuel gas is passed into operative proximity with the catalyst composition, to convert at least a portion of the carbon monoxide in the gas into carbon dioxide and **hydrogen** by a water gas shift reaction.

USE - Reducing the amount of carbon monoxide in process fuel gas and processing **hydrogen** rich gas streams for use in **fuel cells** (claimed).

ADVANTAGE - The reduction method uses a catalyst composition which obviates the requirements for catalyst pre-reduction, and minimizes the need to protect the catalyst from oxygen during operation and/or **shutdown**. The inclusion of zirconia with ceria promoter increases the number of oxygen vacancies, and thus the activity of the composition. Zirconia increases the resistance of ceria to sintering, thereby improving the durability of the catalyst composition.

DESCRIPTION OF DRAWING(S) - The figure is a graph depicting a plot of shift conversion activity of the improved catalyst versus that of the copper/zinc oxide catalyst.

Dwg.2/2

FS CPI EPI
FA AB; GI; DCN
MC CPI: E11-E; E11-Q01; E11-Q02; E11-S; E31-A02; E31-N05B; H04-E06; H04-F02E; L03-E04; N02-F02; N06-E01; N07-C
EPI: X16-C09

L25 ANSWER 10 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2000-362845 [31] WPIX
DNN N2000-271351
TI **Purging fuel cell** stack by opening solenoid valve to pass nitrogen into inlet of stack to push out **hydrogen** from stack.
DC X16
PA (ANON) ANONYMOUS
CYC 1
PI RD 431044 A 20000310 (200031)* 1p H01M000-00
ADT RD 431044 A RD 2000-431044 20000220
PRAI RD 2000-431044 20000220
IC ICM H01M000-00
AB RD 431044 A UPAB: 20000630

NOVELTY - Method allows for a rapid stop when a system failure occurs, the anode side (containing nitrogen) exiting immediately out of combustible vent (4). An inert gas e.g. nitrogen **purges** the **fuel cell** stack (1) to removet **hydrogen** completely. During a rapid stop vent solenoids (6-8) open to vent the gases. As any fuel to the combustor could cause an overload, the outlet nitrogen **purge** solenoid (11) opens and inlet nitrogen **purge** solenoid (12) remains closed. The nitrogen reverses the normal gas flows in the stack and forces them back to the vents at the stack inlet.

USE - Method is for normal or rapid **shutdown** of a **fuel cell** stack.

DESCRIPTION OF DRAWING(S) - The figure shows the **fuel cell** stack arrangement.

Fuel cell stack 1
Combustion vent 4
Vent solenoids 6-8
Outlet nitrogen **purging** solenoid 11
Inlet nitrogen **purge** solenoid 12

Dwg.1/1
FS EPI
FA AB; GI
MC EPI: X16-C09

L25 ANSWER 11 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1999-238598 [20] WPIX
DNN N1999-177865 DNC C1999-070041
TI **Fuel cell** electricity generator device - has **purge** gas line connected between container via gas blower and junction points of cut-off valve and cooler via steam separator.
DC L03 X16
PA (ISHI) ISHIKAWAJIMA HARIMA HEAVY IND
CYC 1
PI JP 11067252 A 19990309 (199920)* 5p H01M008-04
ADT JP 11067252 A JP 1997-229076 19970826
PRAI JP 1997-229076 19970826
IC ICM H01M008-04
ICS H01M008-06
AB JP 11067252 A UPAB: 19990525
NOVELTY - A container (21) storing fuel battery (20) generates electricity using cathode gas containing oxygen and anode gas containing **hydrogen**. Anode waste gas ejected from anode and cathode waste gas ejected from the cathode are burnt. A carbon dioxide recycle line (7) supplies combustion gas from a modifier (22) to a cathode (C).

DETAILED DESCRIPTION - A gas emission line (16) connected to the CO2 recycle line (7) exhausts residual gas via cooler (50), cut-off valve (52) and flow control valve (54). A **purge** gas line (15) is connected between a container (21) via a gas blower (38) and junction points of cut-off valve and a cooler (50) via a steam separator (37). The cooler is connected to CO2 recycle line.

USE - None given.

ADVANTAGE - As residual gas in plant during emergency **shut down** was cooled, and cut-off valve and flow control valve are made into low temperature, usage of hot waste gas discharge valve is avoided. As procurement expense of these valves is reduced, plant cost is reduced.

DESCRIPTION OF DRAWING - The figure shows the block diagram of fuel battery electricity generator device. (7) Carbon dioxide recycle line; (15) **Purge** gas line; (20) Fuel battery; (21) Container; (22) Modifier; (37) Steam separator; (38) Gas blower; (50) Cooler; (52) Cut-off valve; (54) Flow control valve; (C) Cathode.

Dwg.1/2
FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C; X16-C09; X16-C15

L25 ANSWER 12 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1993-377336 [47] WPIX
DNN N1993-291385 DNC C1993-167526
TI Monitoring electrochemical potential of **fuel-cell** component - using electrochemical sensor comprising pair of wires one of which acts as **hydrogen** reference electrode.
DC L03 S03 X16
IN BREAULT, R D; KUNZ, H R
PA (TOKE) TOSHIBA KK; (ITFU) INT FUEL CELLS CORP
CYC 2
PI US 5262034 A 19931116 (199347)* 6p G01N027-26

JP 06236767 A 19940823 (199438) 5p H01M008-04
ADT US 5262034 A US 1992-966002 19921023; JP 06236767 A JP 1993-265194 19931022
PRAI US 1992-966002 19921023
IC ICM G01N027-26; H01M008-04
ICS G01N027-416; G01R031-36
AB US 5262034 A UPAB: 19940111
Monitoring the electrochemical potential of **fuel cell** components, comprises (a) using an electrochemical sensor (40) having a pair of electrically conductive wires (10); and a porous, non-conductive conduit (50) in contact with the wires; (b) bringing electrolyte into contact with the conduit; (c) wicking the electrolyte into the pores of the conduit; (d) applying a voltage across the wires; (e) increasing the voltage until **H2** evolves from the second wire; and (f) measuring the potential difference between the **fuel cell** component and the second wire.

The second wire provides a reference potential which is near to the open circuit potential of a **hydrogen** electrode.

USE/ADVANTAGE - The sensor can be used to monitor anode and cathode polarisation during cell operation, and anode and cathode voltages and resistivity during **shutdown**. Anode polarisation establishes the point at which the **fuel cell** should be **shut down** to prevent failure due to corrosion. Anode and cathode voltages can be used to control N2 **purges** to maintain low O2 content in anode and cathode chambers.

Dwg.3/4
FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: S03-E03; X16-C; X16-H01

L25 ANSWER 13 OF 16 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1991-223134 [30] WPIX
DNN N1991-170301
TI **Fuel cell** system - controls electrode potential in adverse conditions using nitrogen to **purge** anode and nitrogen-oxygen mix to **purge** cathode.
DC X16
IN BUSHNELL, C L; DAVIS, C L
PA (ITFU) INT FUEL CELLS CORP
CYC 16
PI WO 9110266 A 19910711 (199130)* 11p
RW: AT BE CH DE DK ES FR GB GR IT LU NL SE
W: CA DK JP
US 5045414 A 19910903 (199138) 6p
EP 461248 A 19911218 (199151)
R: DE ES FR GB IT NL SE
JP 04505074 W 19920903 (199242) 5p H01M008-04
WO 9110266 A3 19910822 (199508)
ADT US 5045414 A US 1989-458852 19891229; EP 461248 A EP 1991-902850 19901207; JP 04505074 W WO 1990-US7157 19901207, JP 1991-503232 19901207; WO 9110266 A3 WO 1990-US7157 19901207
FDT JP 04505074 W Based on WO 9110266
PRAI US 1989-458852 19891229
REP NoSR.Pub; 7.Jnl.Ref; CH 485335; EP 341189; GB 1296831; JP 01304668; JP 60020473; JP 60140672; JP 61066374; JP 62234871; JP 62285368; JP 63254677; US 4250231; US 4555452
IC ICM H01M008-04

AB WO 9110266 A UPAB: 19990630
The electrochemical **fuel cell** (10), having anode (11) and cathode (12) set in electrolytic liquid using a gaseous mixture, comprises an 0.5% oxygen, 99.5% nitrogen gas mix by volume, to **purge** the cathode during off-power conditions, limiting the cathode potential to elow 0.8 volts. During **shutdown** pressurised nitrogen gas from tanks (20A-D) is fed to junction 'T' and hence to fuel processor (31) and anode (11) **purging** and preventing the formation of nickel carbonyl.

In the ejector (21) line, filtered air at ambient pressure is introduced in the 0.5% proportion to yield the **purging** mix for the cathode (12).

ADVANTAGE - Enhances **fuel cell** electrical potential control preventing electrode damage.
Dwg.1/1

FS EPI
FA AB; GI
MC EPI: X16-C

L25 ANSWER 14 OF 16 JAPIO (C) 2004 JPO on STN
AN 1989-159966 JAPIO
TI METHOD FOR **SHUTDOWN** OF PHOSPHORIC ACID TYPE **FUEL CELL** POWER-GENERATING DEVICE
IN OOYAMA ATSUTOMO; HIROTA TOSHIO; KAMOSHITA TOMOYOSHI; UJIIE TAKASHI; OUCHI TAKASHI
PA FUJI ELECTRIC CO LTD
PI JP 01159966 A 19890622 Heisei
AI JP 1987-317148 (JP62317148 Showa) 19871215
PRAI JP 1987-317148 19871215
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1989
IC ICM H01M008-04
AB PURPOSE: To eliminate danger such as explosion of residual **hydrogen** at the time of stopping by shutting off supply of crude material to a modifier in compli ance with a given abnormality signal, closing the outlet valve of a blower, then opening an inert gas supply valve, and supplying nitrogen gas to the crude material heating part of the modifier.
CONSTITUTION: An abnormality sensor 33 senses any abnormality in a combus tion air blower 3 during a **fuel cell** power generator in operation, and an electric signal is emitted. In compliance with this electric signal, supply of raw material to a modifier 2 is stopped by stopping a raw material pump 6 and shutting a raw material supply valve 15. The outlet side air supply valve 32 of the blower 3 is closed, and an inert gas supply valve 31 is opened. The residual raw material 20 is modified into fuel gas 21 at a modificational reaction part 2B, and power generation is continued until a heater 2A and reaction part 2B are **purged** with nitrogen 28. A reactive air blower 4 is stopped, and a valve on its discharge side is closed, and a nitrogen **purging** valve 18 and an exhaust valve 19 are opened to perform nitrogen replacement in the air chamber of the **fuel cell**. Now stop is made.

L25 ANSWER 15 OF 16 HCAPLUS COPYRIGHT 2004 ACS on STN
AN 1986:575903 HCAPLUS
DN 105:175903
ED Entered STN: 15 Nov 1986
TI Diesel fuel processing for phosphoric acid **fuel cells**

AU Steinfeld, G.; Skaanderup-Larsen, J.; Kurpit, S. S.
CS Energy Res. Corp., Danbury, CT, 06813, USA
SO Proceedings of the Intersociety Energy Conversion Engineering Conference (1986), 21st(Vol. 2), 1092-6
CODEN: PIECDE; ISSN: 0146-955X
DT Journal
LA English
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 49, 51
AB In a process for the production of H-containing gas from diesel fuel, the fuel is
1st desulfurized into stages, each of which consists of hydrodesulfurization and H2S removal by ZnO; this allows steam reforming with a conventional catalyst and operating conditions, with the addnl. benefit of increased aromatic content from the hydrotreatment. Complete conversion of diesel fuel was obtained during the 1st 200 h of operation, and no C buildup was detected. Cycling of the hydrodesulfurization test unit and use of CO2 **purge** gas resulted in S levels higher than those obtained during continuous operation and caused partial deactivation of the reformer. Operating conditions in the hydrodesulfurization subsystem must be maintained such that the S level is kept low and that the exit lines from the subsystem are not contaminated during startup and **shutdowns**.
ST diesel fuel desulfurization **hydrogen** manuf; **fuel cell hydrogen** diesel fuel; steam reforming diesel fuel desulfurization
IT Fuels, diesel
(desulfurization and steam reforming of, for **hydrogen** manufacture for **fuel cells**)
IT **Fuel cells**
(phosphoric acid, **hydrogen** for, manufacture of, from diesel fuel, hydrodesulfurization in)
IT Fuel gas manufacturing
(steam reforming, of diesel fuel, desulfurization for, in **hydrogen**-containing gas manufacture for **fuel cells**)
IT 7783-06-4P, preparation
RL: PREP (Preparation)
(formation and removal of, in diesel fuel desulfurization, in **hydrogen** manufacture for **fuel cells**)
IT **1333-74-0P**, preparation
RL: **PREP (Preparation)**
(manufacture of gas containing, from diesel fuel, for **fuel cells**, two-stage hydrodesulfurization and steam reforming in)
IT 1314-13-2P, reactions
RL: RCT (Reactant); PREP (Preparation); RACT (Reactant or reagent)
(reaction of, with **hydrogen** sulfide, in diesel fuel desulfurization, for steam reforming for **hydrogen** manufacture, for **fuel cells**)

L25 ANSWER 16 OF 16 JAPIO (C) 2004 JPO on STN
AN 2003-100332 JAPIO
TI **FUEL CELL** POWER GENERATION SYSTEM
IN UEDA TETSUYA; MIYAUCHI SHINJI; OZEKI MASATAKA; ASOU TOMOMICHI
PA MATSUSHITA ELECTRIC IND CO LTD
PI JP 2003100332 A 20030404 Heisei
AI JP 2001-285422 (JP2001285422 Heisei) 20010919
PRAI JP 2001-285422 20010919
SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2003

IC ICM H01M008-04
ICS H01M008-06

AB PROBLEM TO BE SOLVED: To provide a **fuel cell** system in which no exchange and supplement of the nitrogen bomb are needed, and running cost of the system is low because no equipment such as a large nitrogen bomb provided for nitrogen **purge** operation in the **shutdown** of every time nor no large space are needed, while initial cost for the equipment is low.
SOLUTION: When the operation of the **fuel cell** is stopped, the supply of a starting gas for a reformer is stopped at first. In an emergency stop, **hydrogen** remaining in the reformer and in the **fuel cell** are exhausted by using inert gas supplied from the inert gas supplying means. In an ordinary stop, **hydrogen** remaining in the reformer and in the **fuel cell** is exhausted without using inert gas.

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